OSDAV Public School, Kaithal
First Unit Test(May, 2024)
Class : XI
Subject : Physics

SET –B

Time: 1 hr **M.M. : 30**

General Instructions:-

I. **There are 15 questions in all. All questions are compulsory.**
II. **This question paper has five sections: Section A, Section B, Section C, Section D and Section E. All the sections are compulsory.**
III. **Section A contains seven MCQ of one mark each, Section B contains four questions of two marks each, Section C contains two questions of three marks each, section D contains one question of 4 marks and section E contains one long questions of five marks .**

Q.No.	Questions	Marks
	SECTION - A	
1	Differentiation of tan x will give a) $\tan^2 x$ b) sec x tan x c) $\sec^2 x$ d) none of these	1
2	$[MLT^{-2}]$ is the dimensional formula for a) Force b) Linear momentum c) Acceleration d) none of these	1
3	What will be the value of $\log_a a$? a) a b) 1 c) zero d) none of these	1
4	The value of sin 150° is a) 3/2 b) 1/2 c) $1/\sqrt{2}$ d) $\sqrt{3}/2$	1
5	What will be the dimensional formula for energy a) $[ML^2T^{-2}]$ b) $[MLT^{-2}]$ c) $[ML^2T^{-3}]$ d) none of these	1
6	Assertion: Integration is inverse of Differentiation. Reason: Integration means calculating slopes. (a) Both A and R are true and R is the correct explanation of A (b) Both A and R are true but R is not the correct explanation of A (c) A is true but R is false (d) A is false and R is also false	1
7	Assertion: Dimensional formula for work and energy is same. Reason: Work done is equal to change in energy. (a) Both A and R are true and R is the correct explanation of A (b) Both A and R are true but R is not the correct explanation of A (c) A is true but R is false (d) A is false and R is also false	1
	SECTION - B	
8	Solve the equation for x: $4x^2 - 4ax + (a^2 - b^2) = 0$	2
9	Expand the following using logarithms : a) $PV^{\gamma} = K$ b) $\upsilon = \frac{1}{2l}\sqrt{\frac{T}{u}}$	2
10	i) Expand these Trigonometric formulaes a) Cos (A+B) b) Sin A + Sin B	2
11	Find $\frac{dy}{dx}$ when $y = x^2 \log_e x$	2

	SECTION - C	
12	If the motion of the particle is represented by $S = 2t^3 + t^2 - 2t + 2$. Find the position, velocity and acceleration of the particle after 2 seconds.	3
13	Find the value of 10 joule in a system when mass is 1 kg, length is 10 cm and time 5 min.	3
	Section – D	
14	a) Integrate the following functions with respect to x (i) $\int_{x=\infty}^{x=R} \frac{GMm}{x^2} dx$ ii) $\int_{u}^{v} M\, v\, dv$ b) Define one metre.	2 2
	Section - E	
15	a) Assuming that mass m of the largest stone that can be moved by a flowing river depends on the velocity v, the density ϱ and acceleration due to gravity g, show that m varies with sixth power of the velocity of flow. b) The value of acceleration due to gravity (g) at a height h above the surface of earth is given by $g' = gR^2 / (R+h)^2$. If $h \ll R$, then prove that $g' = g\left(1 - \frac{2h}{R}\right)$.	3 2

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SET -A

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I. **There are 15 questions in all. All questions are compulsory.**
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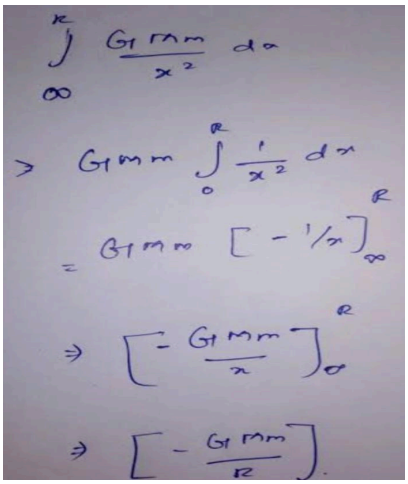
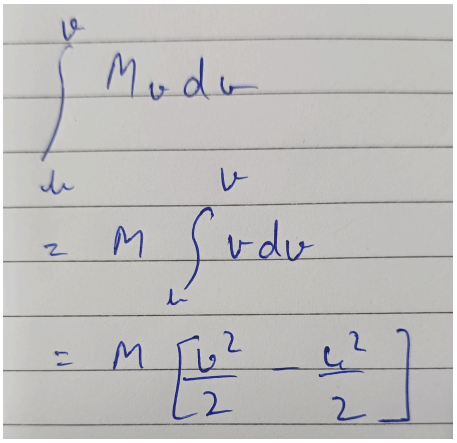
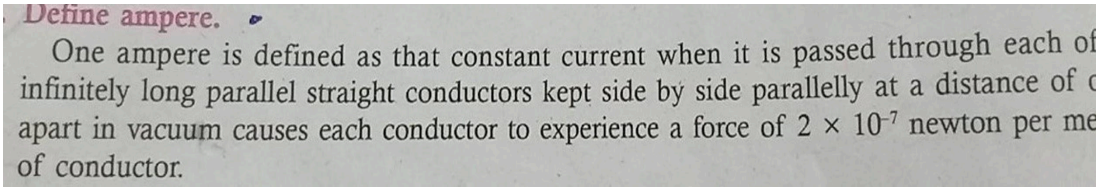
Q.No.	Questions	Marks
	SECTION - A	
1	The value of sin 330° is a) -3/2 b) -1/2 c) $1/\sqrt{2}$ d) $\sqrt{3}/2$	1
2	What will be the dimensional formula for work a) $[ML^2T^{-2}]$ b) $[MLT^{-2}]$ c) $[ML^2T^{-3}]$ d) none of these	1
3	Differentiation of sec x will give a) $\tan^2 x$ b) sec x tan x c) $\sec^2 x$ d) none of these	1
4	$[MLT^{-1}]$ is the dimensional formula for a) Force b) Linear momentum c) Acceleration d) none of these	1
5	What will be the value of $\log_a 1$? a) a b) 1 c) zero d) none of these	1
6	Assertion: Dimensional formula for work and energy is same. Reason: Work done is equal to change in energy. (a) Both A and R are true and R is the correct explanation of A (b) Both A and R are true but R is not the correct explanation of A (c) A is true but R is false (d) A is false and R is also false	1
7	Assertion: Integration is inverse of Differentiation. Reason: Integration means calculating slopes. (a) Both A and R are true and R is the correct explanation of A (b) Both A and R are true but R is not the correct explanation of A (c) A is true but R is false (d) A is false and R is also false	1
	SECTION - B	
8	Solve the equation for x: $4x^2 - 4ax + (a^2 - b^2) = 0$	2
9	Expand the following using logarithms : a) $PV^{\gamma} = K$ b) $T = 2\pi\sqrt{\frac{I}{\alpha}}$	2
10	i) Expand these Trigonometric formulaes a) Sin(A+B) b) Cos A + Cos B	2
11	Find $\frac{dy}{dx}$ when $y = x^2 \log_e x$	2
	SECTION - C	
12	If the motion of the particle is represented by $S = t^3 + t^2 - t + 2$. Find the position,	3

	velocity and acceleration of the particle after 2 seconds.	
13	Find the value of 10 joule in a system when mass is 1 kg, length is 10 cm and time 5 min.	3
	Section – D	
14	a) Integrate the following functions with respect to x (i) $\int_{x=\infty}^{x=R} \frac{GMm}{x^2} dx$ ii) $\int_{u}^{v} M\, v\, dv$ b) Define one Ampere.	2 1 1
	Section - E	
15	a) Given that the time period T of oscillation of a gas bubble from an explosion under water depends on P, d and E where P is the pressure, d is the density of water and E is the total energy of the explosion. Find dimensionally a relation for T. b) The value of acceleration due to gravity (g) at a height h above the surface of earth is given by $g' = gR^2 / (R+h)^2$. If h<<R , then prove that $g' = g\left(1 - \frac{2h}{R}\right)$.	3 2

OSDAV Public School Kaithal
Marking Scheme
Physics - XI
Set - A

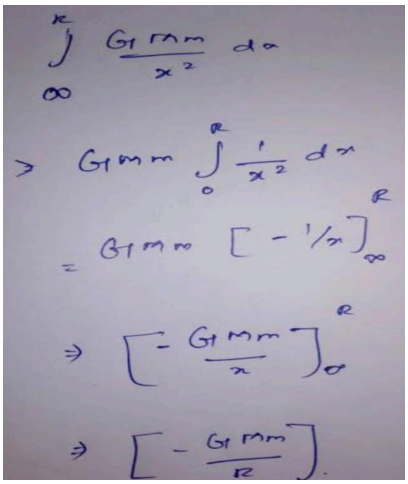
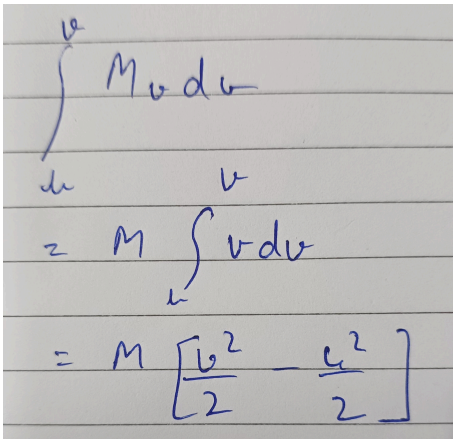
1	B	1
2	A	1
3	B	1
4	B	1
5	C	1
6	A	1
7	C	1
8	$D = b^2 - 4ac$ $=16a^2 - 16 a^2 + 16 b^2$ $=16b^2$ X= (a+b)/2 & (a-b)/2	1 1
9	a) $Log_e p + Log_e v^{\gamma} = Log_e k$ $Log_e p + \gamma Log_e v = Log_e k$ b) $\log_e T = \log_e 2\pi + ½ \log_e(I/ \alpha)$ $\log_e T = \log_e 2 + \log_e \pi + ½ (\log_e I - \log_e \alpha)$	0.5 0.5 0.5 0.5
10	a) Sin A Cos B + Cos A Sin B b) 2 Cos (A + B) /2 Cos (A-B)/2	1 1
11	$y = x^2 \log_e x$ $dy/dx = x^2 d(\log_e x)/dx + d(x^2)/dx \log_e x$ $dy/dx = x^2(1/x) + 2x (\log_e x)$ $dy/dx = x + 2x (\log_e x)$ $dy/dx = x (1 + 2 \log_e x)$	 0.5 0.5 0.5 0.5
12	$S = t^3 + t^2 – t + 2$ For t = 2 S = 12 m $dS/dt = 3 t^2 +2t - 1$ For t = 2 V = 15m/s dv/dt = 6t + 2 for t = 2 $a = 14 m/s^2$	 0.5 0.5 0.5 0.5 0.5 0.5

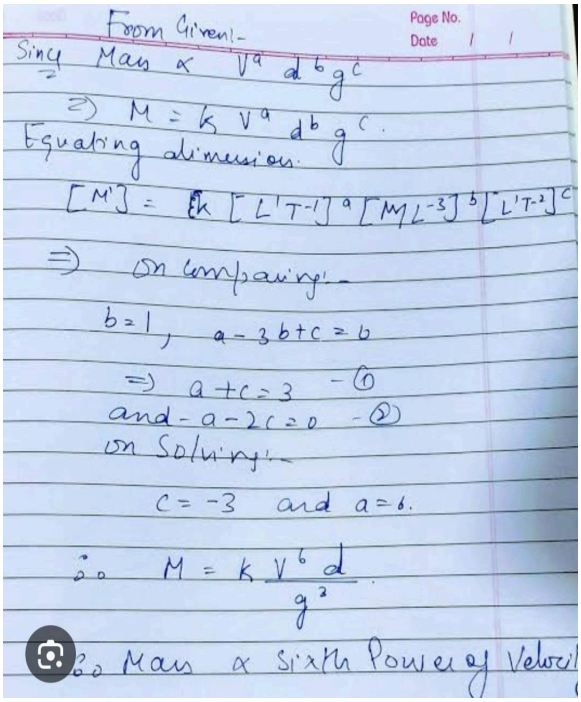
13	$n_2 = n_1 [(M_1/M_2)^a (L_1/L_2)^b (T_1/T_2)^C]$ $n_2 = 10 [(1Kg/1Kg)^1 (1m/10cm)^2 (1s/5\ min.)^{-2}]$ $n_2 = 10 [(1Kg/1Kg)^1 (100cm/10cm)^2 (1s/300s)^{-2}]$ $n_2 = 10 \times 100 \times 300 \times 300$ $n_2 = 9 \times 10^7$ new unit	0.5 1 0.5 0.5 0.5
14	a) 	0.5 0.5 0.5 0.5
	b) 	0.5 0.5
	ii) 	1

15	a) Time period depends upon on pressure 'P', density 'd' and energy due to explosion 'E' as follows; $t \propto P^a d^b E^c$ Taking dimension of both side, $[T] = K[ML^{-1}T^{-2}]^a[ML^{-3}]^b[ML^2T^{-2}]^c$ $[T] = K[M^aL^{-a}T^{-2a}][M^bL^{-3b}][M^cL^{2c}T^{-2c}]$ $[T] = K[M^{a+b+c}L^{-a-3b+2c}T^{-2a-2c}]$ $a + b + c = 0 \Rightarrow -b = a + c$.....(1), $-a + 2c = 3b$.....(2), $-2a - 2c = 1$....(3) from eq(1) and eq(2), $b = \frac{3}{2}c$ puuting value of 'b' in in eq(1) $a = \frac{-5c}{2}$ and solve with eq(3) we get, $c = \frac{1}{3}$ and $a = \frac{-5}{6}$, $b = \frac{1}{2}$ puuting these value in equation of time, $t \propto P^{\frac{-5}{6}} d^{\frac{1}{2}} E^{\frac{1}{3}}$	0.5 0.5 0.5 0.5 0.5 0.5
	b) $g\left(\frac{R}{R+h}\right)^2 = g\left(\frac{1}{1+\frac{h}{R}}\right)^2 = \frac{g}{\left(1+\frac{h}{R}\right)^2} = g\left(1+\frac{h}{R}\right)^{-2}$ we are given $h << R$, hence, $h/R << 1$ can write $g' = g\left(1 - \frac{2h}{R}\right)$.	1 0.5 0.5

OSDAV Public School Kaithal
Marking Scheme
Physics - XI
Set - B

1	C	1
2	A	1
3	B	1
4	B	1
5	A	1
6	C	1
7	A	1
8	$D = b^2 - 4ac$ $=16a^2 - 16 a^2 + 16 b^2$ $=16b^2$ X= (a+b)/2 & (a-b)/2	1 1
9	a) $Log_e p + Log_e v^{\gamma} = Log_e k$ $Log_e p + \gamma Log_e v = Log_e k$ b) $\log_e v = \log_e(1/2l) + ½ \log_e(T/u)$ $\log_e v = -\log_e 2 - \log_e l + ½ (\log_e T - \log_e u)$	0.5 0.5 0.5 0.5
10	a) Cos A Cos B - SinA Sin B b) 2 Sin(A + B) /2 Cos(A-B)/2	1 1
11	$y = x^2 \log_e x$ $dy/dx = x^2 d(\log_e x)/dx + d(x^2)/dx \log_e x$ $dy/dx = x^2(1/x) + 2x (\log_e x)$ $dy/dx = x + 2x (\log_e x)$ $dy/dx = x (1 + 2 \log_e x)$	 0.5 0.5 0.5 0.5
12	$S = 2t^3 + t^2 – 2t + 2$ For t = 2 S = 18 m $dS/dt = 6t^2 + 2t - 2$ For t = 2 V = 26 m/s dv/dt = 12t + 2 for t = 2 $a = 26 m/s^2$	 0.5 0.5 0.5 0.5 0.5 0.5

13	$n_2 = n_1 [(M_1/M_2)^a (L_1/L_2)^b (T_1/T_2)^C]$ $n_2 = 10 [(1Kg/1Kg)^1 (1m/10cm)^2 (1s/5\ min.)^{-2}]$ $n_2 = 10 [(1Kg/1Kg)^1 (100cm/10cm)^2 (1s/300s)^{-2}]$ $n_2 = 10 \times 100 \times 300 \times 300$ $n_2 = 9 \times 10^7$ new unit	0.5 1 0.5 0.5 0.5
14	a)  b)  ii) One metre is defined as the distance travelled by light in vacuum in 1299,792,458 of a second	0.5 0.5 0.5 0.5 0.5 0.5 1

15	a) 	0.5 0.5 0.5 0.5 0.5 0.5
	b) $g\left(\frac{R}{R+h}\right)^2 = g\left(\frac{1}{1+\frac{h}{R}}\right)^2 = \frac{g}{\left(1+\frac{h}{R}\right)^2} = g\left(1+\frac{h}{R}\right)^{-2}$ We are given $h \ll R$, hence, $h/R \ll 1$ can write $g' = g\left(1-\frac{2h}{R}\right)$.	1 0.5 0.5